Space Weather Technical Forecast

Issued on Friday, 05 April 2024 at 13:23 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: No significant activity

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Low with peak flare of C3.8 flare observed at 05/0305 UTC from just over the southeast limb. There are seven sunspot regions on the disc, and while they remain small and simple, slow growth is evident across the disc. The largest region, AR3628 is a benign mature unipolar spot.

A number of CMEs were observed leaving the Sun, however these are all missing Earth, originating from around the solar limbs or from the far-side. This includes a partial halo CME which appears likely to have originated from ex-AR3614.

Solar Wind / Geomagnetic Activity: A waning high speed stream was observed, due to Earth gradually leaving the fast wind from CH16. The solar wind speed measured by ACE at L1 was initially slightly elevated, at 450km/s, but rapidly increased to be elevated at near 550km/s around 04/1710UTC, then easing to slightly elevated at around 450 km/s again by 04/2100 UTC. Solar winds then eased to near 400km/s by the end of the period. Density remained around averaged, but rose above average 04/1700-2100 UTC. Total Interplanetary Magnetic Field (IMF) strength, Bt, was Moderate 6-8nT with the north-south component Bz mainly negative (southward) with brief periods of positive (northward) ranging -7nT to +7nT. Phi angle was negative (towards the Sun). Geomagnetic activity was Quiet to Unsettled (Kp2-3).

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) observed at GOES-18 was at background. High energy electron flux (greater than 2MeV) observed at GOES-16 was at background. The associated 24-hour fluence remained well below the Active (1e8 integrated flux) threshold, with a value of 2.56e6 integrated pfu at 05/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Very Low activity is expected, with a slight chance of isolated M-flares. This chance increasing slightly through the period with any further development, or new regions rotating onto the Earth-facing Sun.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs. Solar winds are expected to gradually ease to background days 1-3 (05-07 Apr). A further weak coronal hole enhancement is possible day 4 (08 Apr) however this is unlikely to be significant, with winds perhaps rising to be slightly elevated for a time. Geomagnetic activity is forecast to be Quiet with Unsettled spells day 1 (05 Apr), with a decreasing chance of Active intervals. Mainly Quiet activity is expected through Days 2-4 (06-08) but with a chance of Unsettled to Active intervals day 4 (08 Apr).

Energetic Particles / Solar Radiation: High energy proton flux as observed by GOES-18, is expected to remain at background. High energy electron flux is forecast to initially be at background, but with a chance of a rising trend to Moderate with a slight chance of High levels at diurnal peak by days 3 and 4 (07 and 08 Apr). Electron fluence is expected to remain below the Active (1e8 integrated pfu) threshold throughout.

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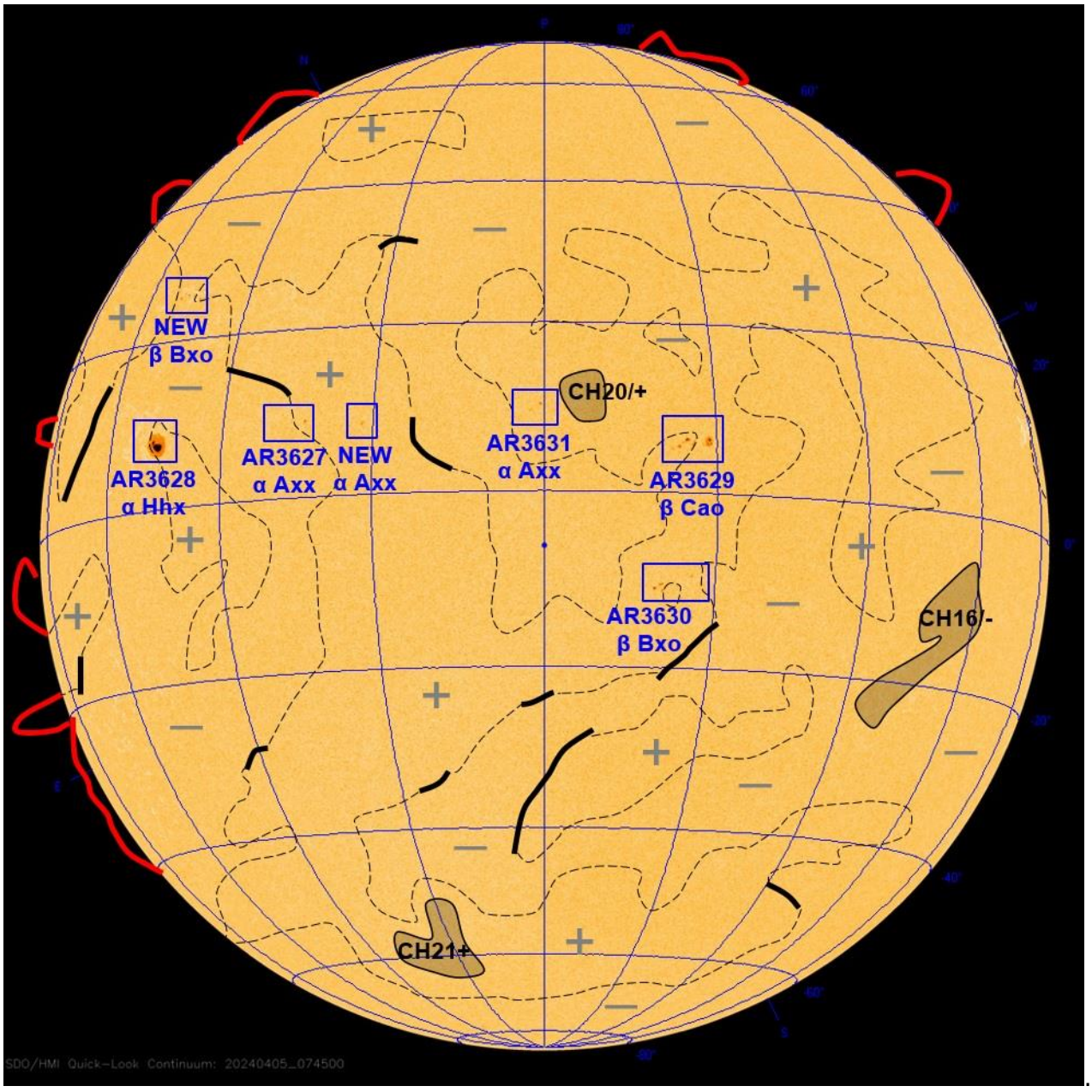
Figure 1. Solar Analysis Valid 05/0800 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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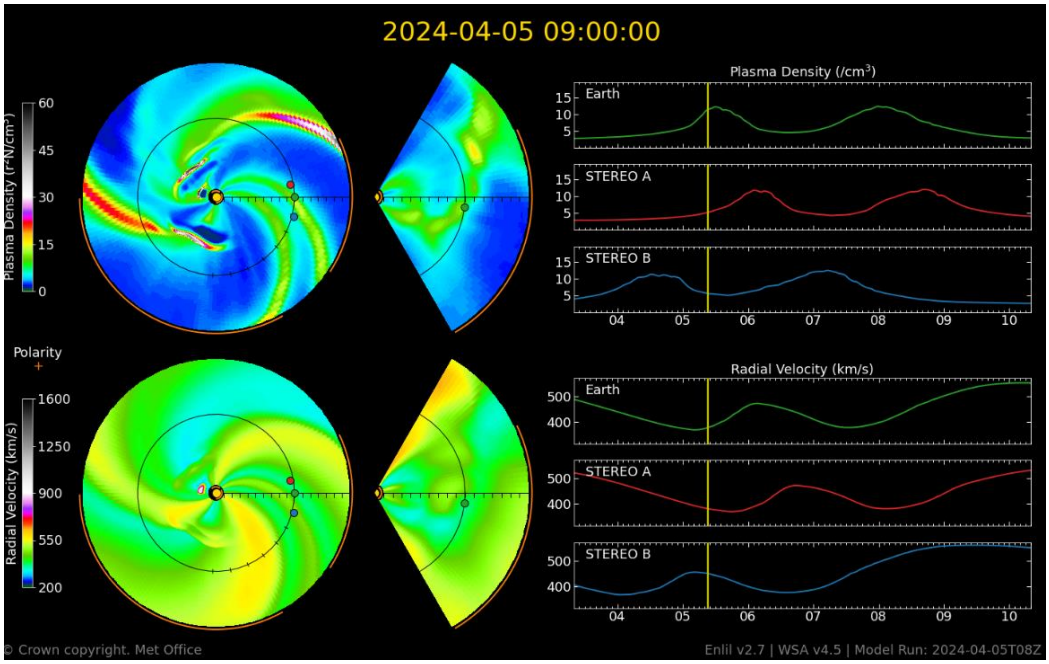
Geomagnetic Storms:

There are no Earth directed CMEs. Solar winds speeds are slightly elevated, due to a waning fast wind from CH16/- and CH17/- but are expected to decline days 1-3 (05-07 Apr), returning to background. Further slight enhancement is possible day 4 (08 Apr) from the arrival of any fast wind associated with small CH18/+, however this is a small and relatively indistinct feature that is unfavoured for any notable geomagnetic response.

Geomagnetic activity is forecast to be Quiet with Unsettled spells day 1 (05 Apr), with a decreasing chance of Active intervals. Mainly Quiet activity is expected through Days 2-4 (06-08) but with a chance of Unsettled to Active intervals day 4 (08 Apr).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: Current Enlil forecast Discounted, as the enhancements shown are not expected.



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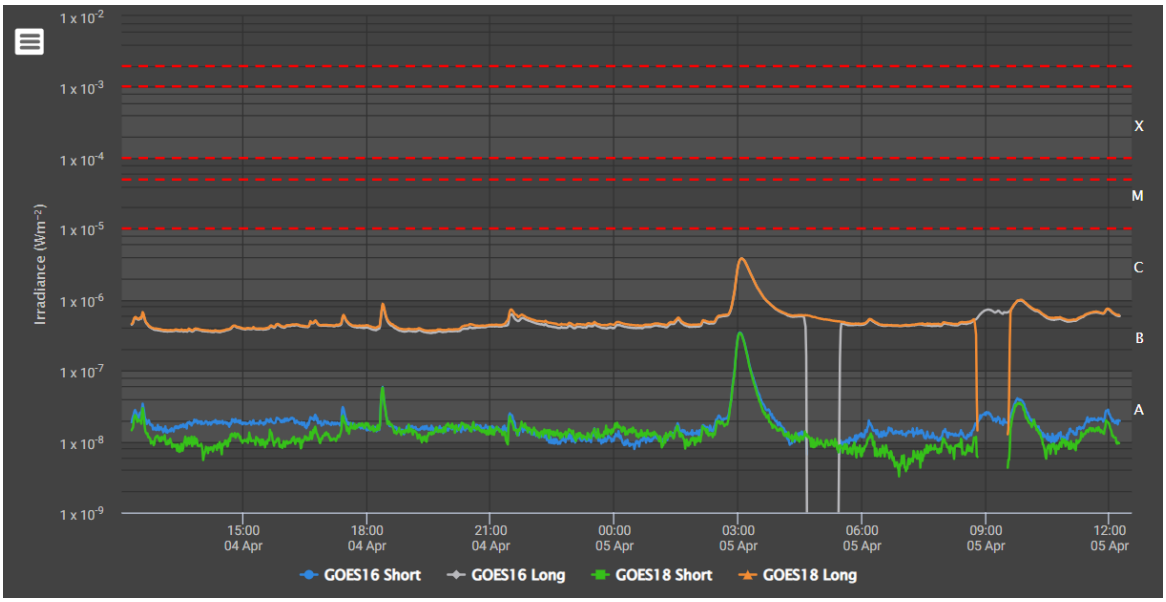
Radio Blackouts - X-Ray Flares:

Activity is expected to be Low with an ongoing likelihood of isolated C-class flares. There is a slight chance of isolated M-flares, increasing slightly through the period with any growth or development of the regions currently on the disc, or due to any new regions rotating on.

There are seven sunspot regions visible. While these are all relatively small and simple, slow growth is evident across a number of them, including AR3630 and A3629 just west of centre disc. The largest visible region is a mature unipolar spot in the northeast. A couple of weak east limb CMEs and magnetic looping evident on SDO-171 also suggest the return of far-sided regions through the coming 24-48 hours, also bringing and increased flare risk

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	10	20	20	30
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: GOES 16/18 X-ray Flux



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Solar Radiation Storms - (High Energy Protons):

High energy proton flux observed by GOES-18 is at background levels and expected to remain so, with none of the visible active regions currently expected to bring a risk of significant proton rich flares.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux as observed by GOES-16 is likely to increase to Moderate at times during the next four days due to the recent fast wind enhancement to the solar wind, with a slight chance of reaching High at diurnal peak by day 3-4 (07-08 Apr). This is low confidence, however, due to lack of a significant connection to either of these coronal hole features as exhibited by the subdued geomagnetic response.

The associated 24 hour electron fluence is expected to remain below the Active (1e8 integrated pfu) threshold, albeit with a potential rising trend. This is supported by both REFM and recurrence which are currently considered to be giving good guidance.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	1
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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